

REMARKS/ARGUMENTS

Applicants responds herein to the Office Action dated April 19, 2004.

Claims 1-3, 5-7 and 9-12 stand rejected on the ground of obviousness over Wakabayashi (4,958,061) in view of Grant (5,228,206). Claims 4 and 8 are being rejected over the aforementioned references, in further view of Okase (6,399,922) and claims 10-12 stand rejected over Wakabayashi and Grant and further in view of Kuznetsov (6,329,304). Reconsideration is requested in view of the amendments to the claims herein and the following remarks.

The claims of the instant application deal with a special situation which arises when a substrate is heated with flashlight in an extremely short time, to reach a temperature on the order of about 1,000°C. The extreme processing conditions are susceptible to cause the substrate to crack or warp, particularly when it contacts any surface.

In accordance with the solution of the instant claims, the substrate is actively lifted by a lifting mechanism which thereafter disengages causing the substrate to remain floating, solely on a layer of gas that is sandwiched between the receiving surface of the susceptor and the substrate. The substrate is irradiated with the intense flashlight during the interval while it is floating toward the receiving surface of the susceptor, without being in contact with any surface.

For example, claim 1 recites "a lifting mechanism operable for actively lifting said substrate held by said susceptor from said receiving surface of said susceptor" Further, claim 1 includes a lift control

"that controls said lifting mechanism to operate said lifting mechanism before the irradiation of flashlight from said light source to lift said substrate held by said susceptor from said receiving surface and to stop the operation of said lifting mechanism as irradiation of flashlight from said light source irradiates said substrate, so that said substrate floats toward said receiving surface supported solely by a gas layer sandwiched between said receiving surface of said susceptor and said substrate."

While the other independent claims in the application define the invention in different terms and with different elements and features, in substance they are directed to similar arrangement that results in the substrate being irradiated with flashlight while it floats toward the

susceptor on a layer of gas. In other words, the substrate is not actively lifted or held up by either a mechanical light nor by air from air jet nozzles or the like.

Turning to the references, the primary reference, Wakabayashi, discloses a heat-treating apparatus that uses halogen lamps. This type of lamp does not produce the instant thermal expansion of the substrate surface as in the present invention which utilizes flash lamps. Wakabayashi describes a chamber 10 provided under halogen lamps 26 wherein a substrate 70 is placed on support beams 52 for being heat-treated by infrared light irradiation from the lamps 26. Because the substrate 70 supported mechanically by the pins 52, a large space 54 is created between the substrates 70 and the upper surface 48 of a platen 18 as described at column 4, lines 35-53 of this reference.

Significantly, while the substrate 70 is being actively lifted from the surface 48 of the platen 18 by the support pins 52, the thermal illumination and heating from lamps 26 is continued (Wakabayashi, column 4, lines 45-53; column 6, lines 3-25).

Thus, aside from the fact that Wakabayashi never applies flashlight irradiation, when it does apply irradiation, it is from halogen lamps and that radiation is provided while the substrate is being actively supported by a mechanical lifting mechanism. Unlike the present invention, Wakabayashi nowhere teaches that the substrate be radiated with flashlight while it is passively floating on a layer of air.

Although "gas" is mentioned at column 4, lines 53-56 in Wakabayashi, the full context of this disclosure is:

"In place of supporting the substrate in a floated state by pins within the chamber, the substrate can be floated by jetting a gas upwardly from the top surface of the platen." (Emphasis added).

In marked distinction to the cited art, the present invention does not jet a gas upwardly and does not actively support the substrate while it is irradiated with the intense heat of the flashlight. As the Examiner will appreciate, the application of any force to a body that is undergoing rapid expansion is deleterious in the context of the present invention.

The Grant reference has been cited solely for the proposition that it is known in the art to utilize xenon flash lamps. However, the secondary Grant reference is entirely silent regarding

the problem of cracking and warping which underlies the problem; arrangement and method that is disclosed by the instant claims. In fact, Grant is further silent regarding the utility and advantages of irradiating a substrate with a flashlight while it is kept in a floating state with only a thin layer of gas being sandwiched between the receiving surface of the susceptor and the underside of the substrate.

Therefore, it would not be obvious to combine these references and, indeed, even if they were combined, the cumulative teachings thereof would still not arrive at the specific teachings of the present invention as defined in each of the independent claims herein.

The remaining dependent claims, of course, include the limitations of their base claims and impose further limitations thereon which place them further apart from the prior art.

For completeness, however, and in view of the application of other references to the dependent claims as mentioned above, it is noted that Okase discloses heating a wafer W to a predetermined process temperature by a resistance heating body 44 embedded in a worktable 36. However, the resistance heating body 44 is a primary heating element and does not perform preheating for light irradiation. Moreover, Okase et al. is silent about the feature of the present invention wherein flashlight irradiation is directed onto a substrate in a floating state with only a thin layer of gas sandwiched between a receiving surface of a susceptor and the back of the substrate.

Kuznetsov discloses increasing energy to be supplied to a heating element 8 during the period of five to fifteen seconds after the entry of a substrate. However, the reference is silent about the feature of the present invention wherein flashlight irradiation is performed on a substrate in a floating state with only a thin layer of gas sandwiched between a receiving surface of a susceptor and the back of the substrate.

In view of the foregoing remarks, it is respectfully submitted that none of the instant claims is obvious over the prior art, whether that prior art is viewed singly or in any combination or permutation.

Accordingly, the Examiner is respectfully requested to reconsider the application, allow the claims as amended and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 19, 2004:

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